

REMARKS

In response to the Office Action mailed January 10, 2005, Applicants amend their application and request reconsideration. Claims 6-12 are added but no claims are cancelled so that claims 1-12 are now pending.

An Information Disclosure Statement was filed March 2, 2005, indication of the cited reference in the next communication is respectfully requested.

The grammatical errors in claim 3 are corrected in response to the claim objection. Claim 5 is amended to eliminate the word “minimum” in response to the rejection of that claim as indefinite.

In this Amendment claim 1, the only examined independent claim, is amended, consistent with the disclosure of the patent application, particularly concerning the first embodiment and Figures 1, 2A and 2B. In the embodiment illustrated in those figures, particularly as shown in Figure 2A, the first wiring 15 is supported by a substrate 1 with an intervening interlayer 2. A low-k film 22 covers that first wiring. A second wiring 29 is disposed within a second part of the low-k film 22, remote from the substrate 1. Vias 28 extend through a first portion of the low-k dielectric layer 22 to the first wiring 15. Those vias electrically interconnect and are in contact with the first and second wirings 29 and 15. Dummy vias 28a extend entirely through the low-k dielectric film 22, particularly through the portion of that film, in the thickness direction, that includes no part of the via 28. The dummy via 28a does not connect with the first wiring layer 15 and thus the use of the term “dummy.” The embodiment of Figure 2A includes the cap film 23 mentioned in claim 2 and absent from the embodiment of Figure 2B. Newly added dependent claim 6 describes the penetration of the dummy via through both parts, the first and second portions, of the low-k dielectric film as shown in Figures 2A and 2B. New claim 7 is similar to an original claim 5 and is supported in the patent application at page 8, lines 9-13 and 17-20.

New dependent claims 8, 10, and 12 describe the first and second wirings and the vias and the dummy vias as being damascene. Thus, the entire structure is described as a dual damascene structure because there are two levels of the damascene structures. As well known in the art, the term “damascene” means that these conducting structures include a film of an electrically conducting material preventing the diffusion of copper and interposed between an adjacent insulating layer and a core layer of copper. The structure is referred to beginning at page 1 of the patent application. Further, the description of the process of making the damascene structures of Figures 1, 2A and 2B is described with regard to Figures 3A-3F at pages 6 and 7 of the patent application. Attention is also directed to page 5, lines

19-22 of the patent application as describing the structure appearing in those newly added dependent claims.

New independent claims 9 and 11 define structures that differ from the structure defined in claim 1 by specifying coplanar relationships of particular surfaces. In claim 9, the second wirings have a surface coplanar with a surface of the low-k dielectric film. Such an arrangement is illustrated in the embodiment of Figure 2B where no cap film 23 is present. Claim 11 is directed to a structure, such as the embodiment illustrated in Figure 2A, in which the second wirings have a surface that is coplanar with the surface of the cap film 23.

Claims 1, 2, and 4 were rejected as anticipated by Hagihara (U.S. Patent 6,570,243). While reference was made to the Japanese published patent application that is a counterpart of Hagihara, the dates of Hagihara suggests that it is prior art to the present patent application. In view of the easier understanding of Hagihara, the comments here respond entirely to the rejection based upon that U.S. patent.

As described in the patent application, the invention provides an important advantage over the prior art in preparing a two-level via structure, particularly dual damascene structure, by avoiding “resist poisoning”. See page 2, lines 1-9. As described at page 6, lines 3-5, resist poisoning is avoided in the invention because of the isolated via in the low-k dielectric film. Moreover, the opening ratio of the dummy vias with respect to the vias is high so that the end points of the etching that forms the via holes can be easily detected and excess etching avoided. See page 8, lines 9-13 of the patent application. These features and advantages are brought out in amended claims 1-5 as well as the added claims 6-8.

Hagihara cannot anticipate amended claim 1 because it does not describe vias and dummy vias having different penetration regions within a low-k dielectric film. What is shown in the figures of Hagihara to which attention was directed is the formation of dummy vias extending to a dummy wiring 2. There is no depiction of the actual, i.e., non-dummy, vias. Therefore, it is impossible to compare the extension of vias versus dummy vias within the low-k dielectric film cited in Hagihara. Without such information, it is impossible to draw the conclusion that claim 1 or its dependent claims 2 and 4 are anticipated by Hagihara. Upon reconsideration, that rejection should be withdrawn.

It is notable that there was no rejection of claims 3 and 5 based upon Hagihara. Further, with regard to the new independent claims 9 and 11, Hagihara simply does not describe the coplanarity of the surfaces identified in those claims in any structure described in Hagihara. Therefore, those new claims 9-12 cannot properly be rejected as anticipated by Hagihara.

Claims 1, 2, 4, and 5 were rejected as anticipated by Hasegawa et al. (U.S. Patent 6,452,274). This rejection is respectfully traversed.

In rejecting claims 1, 2, 4, and 5, the Examiner directed attention to Figure 7F of Hasegawa and designated Hasegawa's dielectric film 78 as corresponding to the low-k dielectric film of claim 1. It is believed that the Examiner intended to designate the dielectric layer 73 in Figure 7F of Hasegawa as corresponding to the low-k dielectric film of claim 1. However, in either event, Figure 7F of Hasegawa cannot anticipate claim 1.

The structure according to claim 1 includes a via in a first portion of the low-k dielectric film. Clearly the via 76 in Hasegawa is within the dielectric film 73, but not within the dielectric film 78. The second wiring of claim 1 was compared to the element 81 in Figure 7F of Hasegawa. That second wiring is on a part of the dielectric film 76 and within the dielectric film 78 but is not in any portion of the dielectric film 73. Based upon the description in the third paragraph of claim 1, only that dielectric film 73 could correspond to the dielectric film of the claim. Since that correspondence is the case, then the second wiring 81 of Hasegawa clearly is not in any part of the dielectric film in which the vias are present. In other words, Hasegawa cannot meet the terms of claim 1 no matter how Figure 7F of Hasegawa is interpreted. Therefore, the rejection for anticipation is erroneous as to that claim and must be withdrawn. It follows, based upon the nature of claims 2, 4, and 5, that those claims cannot be anticipated by Hasegawa if claim 1 is not anticipated by Hasegawa.

Accordingly, further comment on the rejection of those claims is not necessary or provided.

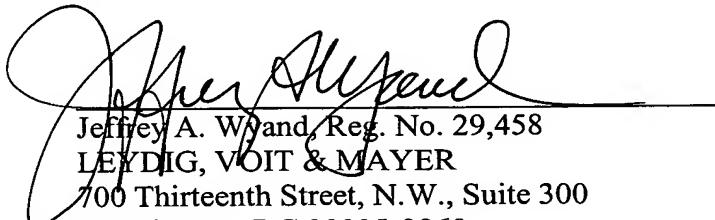
Claim 3 was rejected as unpatentable over Hasegawa in view of Sugiyama et al. (U.S. Patent 6,486,559, hereinafter Sugiyama). That rejection is respectfully traversed.

Sugiyama was cited only as allegedly describing the arrangement of first and second dummy wirings according to claim 3. Even if that disclosure is present in Sugiyama, which is not conceded, the rejection cannot be properly maintained because it depends upon the propriety of the rejection of claim as anticipated by Hasegawa. Therefore, further comment on that claim is not necessary.

In re Appln. of TOMITA et al.
Application No. 10/791,751

Since the foregoing amendment places the originally examined claims in form for allowance and the newly added claims clearly distinguish from the prior art, reconsideration and allowance of all claims now pending are earnestly solicited.

Respectfully submitted,



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